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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003904103 for a patent by QUICKFRAME STEEL FRAMES PTY LTD as filed on 06 August 2003.

WITNESS my hand this
Seventeenth day of August 2004

J. Billingsley

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ORIGINAL

PROVISIONAL SPECIFICATION FOR AN INVENTION ENTITLED:

Invention Title: Metal Roof Truss Connection

Name of Applicant: QuickFrame Steel Frames Pty Ltd

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The invention is described in the following statement:

Metal Roof Truss Connection

FIELD OF THE INVENTION

The present invention relates to a metal roof truss and, in particular, to the connection means between chord members and between chord and stiffening members.

BACKGROUND OF THE INVENTION

Metal roof trusses generally consist of a bottom chord member and top chord members connected in a substantially triangular arrangement, and internal stiffening members that connect the top and bottom chord members. The stiffening members are configured in a triangular web arrangement such that each carries a tension or compression force. Generally, chord members and stiffening members are either box-section members or C-section members depending on the strength requirements of the truss.

Standard metal roof truss chord members include connecting means at their ends so that upper and lower chord members may be connected to each other, and also along their lengths so that stiffening members may be connected between the upper and lower chords. There are numerous known methods of connecting metal roof truss members, most of which include simple bolt connections.

The problem with known connection methods is their general lack of strength and difficulty to assemble. Firstly, when existing truss members are connected, the process typically involves abutment between single surfaces of each member, thereby forming a relatively weak joint. Furthermore, the fact that most abutting surfaces are flat does not provide for a connection with sufficient shear strength. Thirdly, due to the design of most truss members, assembly of the truss can be quite difficult and often time consuming.

It is therefore an object of the present invention to overcome at least some of the aforementioned problems or to provide the public with a useful alternative.

SUMMARY OF THE INVENTION

Therefore in one form of the invention there is proposed a metal roof truss including:

at least one stiffening member including two ends; and

at least one chord member including two ends and at least one region along its length adapted to house a first end of said stiffening member or a first end of a second chord member such that the second end is free to rotate.

Preferably, said metal roof truss includes a lower chord member adapted to lie substantially flat and parallel to the ground and two upper chord members including first ends that are connected at an apex above said lower chord member and second ends connected at either end of said lower chord member in a triangle arrangement.

Preferably, said metal roof truss includes a web of stiffening members that connect upper and lower chord members.

Preferably, said chord and stiffening members include a substantially box-shaped profile including an indented base, opposed side flanges and upper flange edges which define an open channel.

Preferably, said opposed side flanges of said stiffening and chord members extend longitudinally beyond the length of the upper flange edges and indented base thereby forming opposed, substantially semicircular edges at either end of the stiffening and chord members.

Preferably, said opposed semicircular ends of the stiffening and chord members include at their centres internally pressed circular sections.

Preferably, said region of said chord member adapted to house a first end of said stiffening member or second chord member is a section of the upper flange edge that has been splayed thereby increasing the width of said channel.

Preferably, said region of said chord member adapted to house a first end of said stiffening member or second chord member includes internally pressed circular sections on opposed side flanges centrally located below said splayed edge.

Preferably, said semicircular ends of said stiffening or second chord member is adapted to be housed within said region of said chord member such that internally pressed circular sections on the semicircular ends of said stiffening or second chord member abut with internally pressed circular sections on the side flanges of the chord member.

Preferably, each internally pressed circular section includes an aperture at its centre which is co-axially aligned with an aperture located at the centre of the opposing internally pressed circular section.

Preferably, a rivet is used to secure said stiffening or second chord member to said chord member said co-axially aligned apertures of said abutting pressed sections.

Preferably, each opposing internally pressed circular section includes a cylindrical ferrule locked there between.

Preferably, said ferrule prevents internal deflection of said semicircular edges of said stiffening and chord members when said rivet is tightened.

Preferably, just prior to said rivet being tightened, said second end of said stiffening member or second chord member is allowed to rotate about said rivet. This ensures that the second end of either the second chord member or a stiffening member may be adequately aligned with another splayed section.

Preferably, when said rivet is tightened said splayed sections bite into the side flanges of said stiffening member or second chord member thereby strengthening their connection.

Preferably, an apex plate joins stiffening members and chord members at the truss' upper triangle apex.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several implementations of the invention and, together with the description, serve to explain the advantages and principles of the invention. In the drawings:

Figure 1A is a perspective view illustrating the open surface of a metal roof truss chord member in accordance with the present invention;

Figure 1B is a perspective view illustrating the closed surface of the metal roof truss chord member of Figure 2A;

Figure 1C is a side plan view of the metal roof truss chord member of Figure 2A;

Figure 1D is an end plan view of Figure 2A;

Figure 1E is a top plan view of Figure 2A;

Figure 2A is a perspective view illustrating the open surface of a metal roof truss stiffening member in accordance with the present invention;

Figure 2B is a perspective view illustrating the closed surface of the metal roof truss stiffening member of Figure 3A;

Figure 2C is a side plan view of the metal roof truss stiffening member of Figure 3A;

Figure 2D is an end plan view of Figure 3A;

Figure 2E is a top plan view of Figure 3A;

Figure 3 is an exploded perspective view of the connection means between a chord and a stiffening member;

Figure 4A is a side plan view illustrating the connection between a stiffening member and a chord member and possible rotation of the stiffening member relative to the chord member;

Figure 4B is an end plan view of the connection means between the chord and stiffening members of Figure 5A;

Figure 4C is an end cross-sectional view of the connection means between the chord and stiffening members of Figure 5A;

Figure 5 is a perspective view illustrating an alternately configured chord member;

Figure 6 is a side plan view illustrating a metal roof truss including the connection means of the present invention; and

Figure 7 is a side plan view illustrating a metal roof truss including an apex plate.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following detailed description of the invention refers to the accompanying drawings. Although the description includes exemplary embodiments, other embodiments are possible, and changes may be made to the embodiments described without departing from the spirit and scope of the invention.

It is to be understood that although parts of the following description refer to the metal roof truss as a whole, the numbers simply refer to the connection between the end of stiffening member 12 and the lower chord member 20 between splayed edges 42 and 44.

The present invention discloses a metal roof truss 10 including stiffening members 12, 14, 16 and 18 and chord members 20, 22 and 24 and, in particular, the means of connection between them. The connection between members is primarily achieved through the use of opposed internally-pressed sections 26 and 28 located on the ends of each stiffening member that engage identical opposed internally-pressed sections 30 and 32 located either at the ends or along the length of the chord members. The engagement of the pressed sections not only prevents lateral motion of the stiffening members relative to the chord members but also increases the shear strength in each joint. In addition, each member includes cylindrical ferrules 34 which are also located at the ends of each member between opposed pressed sections 26 and 28 which prevent opposed member ends 36 and 38 from internally deflecting under the pressure supplied by engaging rivets 40. The connection between members is further strengthened by the upwardly and outwardly splayed open edges 42 and 44 along the chord members which press against the side flanges 46 and 48 of engaged members when the rivets 40 are tightened. The opposed ends 36 and 38 of each member are rounded in a semicircular shape which allows for the members to be rotated once they have been connected at that end. This allows for construction workers to assemble the truss 10 in a minimum of time and with minimal difficulty in that they may simply align a free end of an engaging member with the splayed opening of another member by simply rotating the free end until the pressed sections are co-axially aligned.

Figures 1A-1E illustrate a section of lower chord member 20 when disconnected from the truss 10. The chord member 20 consists of strip steel that has been rolled into an elongate substantially box-section including an indented base 50 and side flanges 52 and 54 that have been bent at their upper edges 56 and 58 to define an open channel 60. At either end of the chord member 20, side flange 52 extends longitudinally beyond the upper edges 56 and 58 and base 50 to form

semicircular ends 62 and 64 whilst side flange 54 extends longitudinally in the same manner to form semicircular ends 66 and 68.

Each chord member 20, 22 and 24 includes circular pressed sections 70, 72, 74 and 76 located at the ends of each flange 52 and 54 such that the centre of the flange semicircles 62, 64, 66 and 68 also define the centre of each circular pressing 70, 72, 74 and 76 respectively. In addition to the ends of the chord member, there are also opposed pressings 30 and 32 located along the length of the member 20 for engagement with stiffening member 12. All of the opposed circular pressings 30-32, 70-74 and 72-76 include respective central apertures 78-80, 82-86 and 84-88 that are coaxially opposed on each flange 52 and 54 so that a rivet 40 may extend there through. All pressed sections extend inwardly. Housed within semicircular ends 62 and 66, and 64 and 68 are cylindrical ferrules 90 and 92 respectively. The diameters of the cylindrical ferrules 90 and 92 are just larger than those of the internally pressed sections. Therefore, pressed sections 70 and 74 prevent planar movement of ferrule 90 while pressed sections 64 and 68 prevent planar movement of ferrule 92.

Each circular pressed section 30 and 32 of the chord member 20 located along the length of chord member 20 include upwardly and outwardly splayed upper flange edges 42 and 44 above and adjacent thereto. The function of the splayed sections 42 and 44 of the chord member 20 will be explained in more detail further on.

Figures 2A-2E illustrate a section of stiffening member 12 when disconnected from truss 10. The stiffening members consist of the same rolled strip steel as that of the chord members with an indented base 94, side flanges 46 and 48 which define a channel 96 at their upper edges 98 and 100, semicircular ends 36, 38, 102 and 104, ferrules 34 and 106, and internally pressed circular sections 26, 28, 108 and 110. In fact, the stiffening members are identical to the chord members of the truss 10 except for the fact that the stiffening members do not include splayed upper flange edges along their lengths in order to house other connecting stiffening members. Apertures 112, 114, 116 and 118 also exist at the centres of each of the circular pressed sections 26, 28, 108 and 110 respectively.

Figure 3 illustrates the connection means of the present invention, the way in which stiffening member 12 connects with chord member 20 and it should now be apparent the purpose of the upwardly and outwardly splayed flange upper edges 42 and 44 and the cylindrical ferrule 34. One end of stiffening member 12 is inserted

through the splayed opening of chord member 20. The circular pressed sections 26 and 28 of stiffening member 12, which contain there between ferrule 34, are then manually aligned with the circular pressed sections 30 and 32 respectively of chord member 20, i.e. until apertures 78, 112, 114 and 80 are co-axially aligned. Now rivet 40 are placed through the co-axially aligned apertures with washer 120 and fastened on the opposite side with rivet head 122 and washer 124. It should now be understood that ferrule 34 acts to prevent deflection of semicircular extensions 36 and 38 by the force provided by rivet 40.

Referring now to Figures 4A-4C, it should also become apparent that when assembling the metal roof truss 10 of the present invention, one would simply connect one end of a stiffening member 12 and then simply rotate the free end of the member until it is aligned with the connection means of a second chord member. The dotted stiffening member 126 in Figure 4A illustrates a possible rotation that may take place about the pivot point which is in fact the rivet 40. Once the connection means have been successfully aligned, then further tightening of the rivet 40 may take place.

Upon still further tightening of the rivet 40 the straight edges of upwardly and outwardly splayed upper flange edges 42 and 44 provide further strength to the resultant joint in that they 'bite' the side flanges 46 and 48 of the stiffening member 12 in place. This can be clearly seen in Figure 5C. Therefore, the stiffening member 12 is not only locked in place by the rivet connection 40 but also by the biting mechanism provided by the splayed edges 40 and 42.

Figure 5 illustrates an alternate chord member 128 whereby rather than including splayed upper edges of side flanges, there simply exists a rectangular space 130 in which a stiffening member is free to rotate. Therefore, in this embodiment a stiffening member may be connected to the chord member 128 in the same way as previously described, except that there will not be a secondary strengthening means in the form of the splayed upper flange edges but will simply depend on the strength provided by the nesting pressed sections.

Figure 6 illustrates a metal roof truss 10 incorporating the connection means described in the present invention. As can be seen, the truss 10 consists of a lower chord member 20 and two upper chord members 22 and 24 connected to each other at their ends and defining the outer perimeter of the truss in a triangular configuration. The truss 10 further includes four stiffening members 12, 14, 16 and 18

which connect the upper and lower chords. The chord members also include ten splayed openings to allow for connecting members to extend there through.

Figure 7 illustrates an alternate metal roof truss 132 including an apex plate 134. Apex plate 134 connects the upper ends of chord members 138 and 140 and stiffening members 144, 166 and 188. It is to be understood that apex plate 134 also includes pressed circular sections that are identical with the pressed circular sections located on the stiffening and chord members of the truss 132. The apex plate 134 tapers outwards at its lower end so as to accommodate for the three stiffening members 144, 146 and 148. It is to be understood that the present invention is not limited to this shape of apex plate and that any plate capable of accommodating members that incorporate the connection means of the present invention will be adequate.

Furthermore, the above arrangements of truss members are examples only and are not intended to limit the present invention to only these arrangements. For example, metal roof truss 10 may well include nine stiffening members rather than four.

In summary, the present invention discloses a novel connection means between various members of a metal roof truss, namely the connection between individual chord members and the connection between chord and stiffening members. The engagement of internally pressed circular sections of each member provide for a higher shear strength connection in that the lateral movement of the connecting members is prevented. The inclusion of ferrules at the ends of each member provide for yet further strength in that when the rivet extending through opposed rounded ends is tightened, the ends are prevented from inwardly deflecting. Unlike existing connection means, a very secure connection can be achieved in that there are two points of contact between connecting members rather than only one. In order to secure a member within a splayed opening absolutely, the edges of the opening are made to bite into the side flanges of the member upon final tightening of the rivet. The above not only provides for a much stronger connection between members of a metal roof truss but also a more efficient assembly method with respect to time and complexity in that once members are lightly fixed at one end, the free end may be rotated through the splayed opening until it is adequately aligned.

Further advantages and improvements may very well be made to the present invention without deviating from its scope. Although the invention has been shown

and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope and spirit of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Dated this 5 August 2003

Quick Frame Steel Frames Pty Ltd
By their Patent Attorneys
LESICAR PERRIN

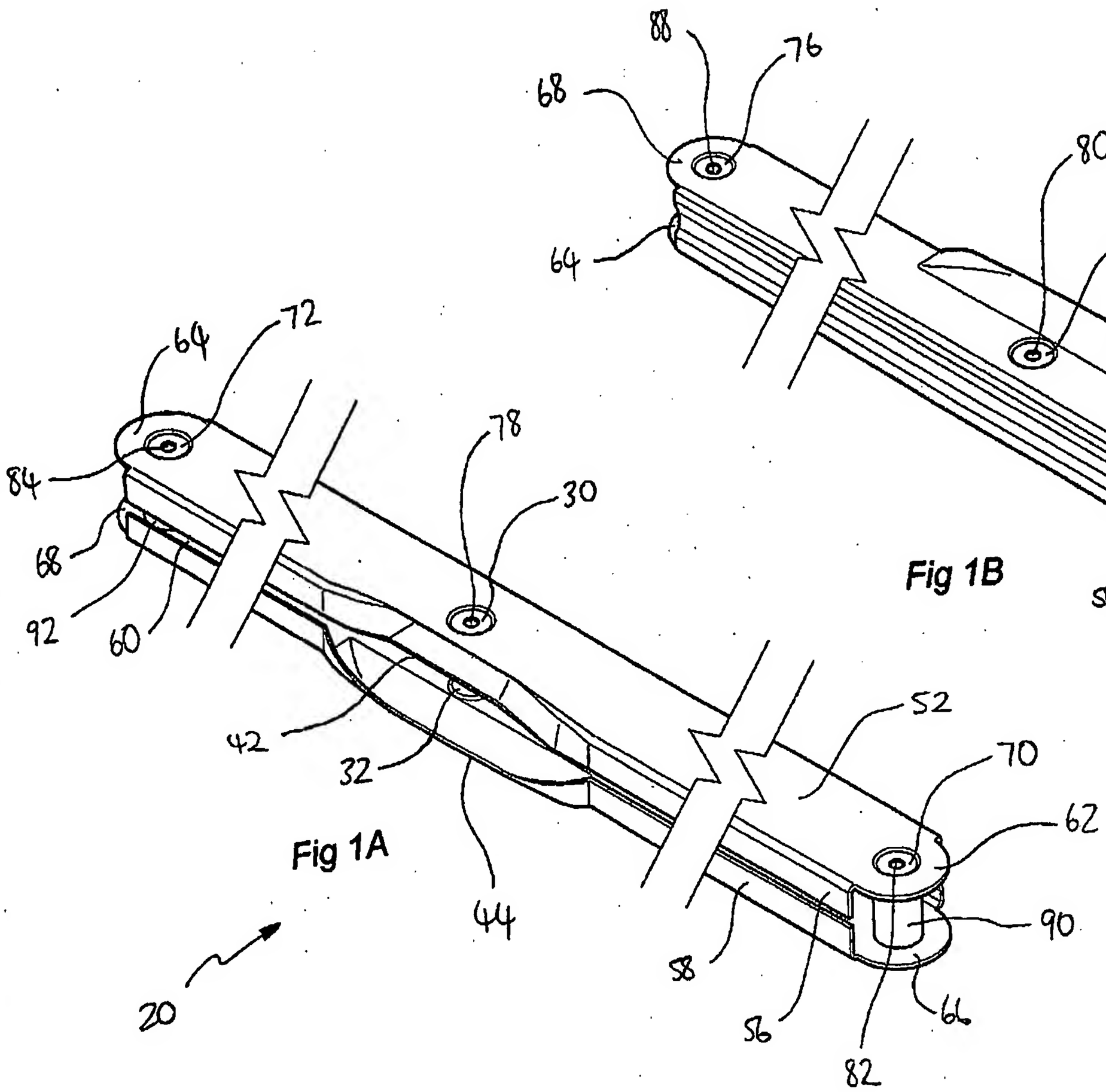

20
64
72
84
68
92
60
78
30
42
32
44
20

Fig 1A

88
76
68
64
20
80
32
44
54
74
66
90
62
86
50
52
70
62
90
58
56
82
64

Fig 1B

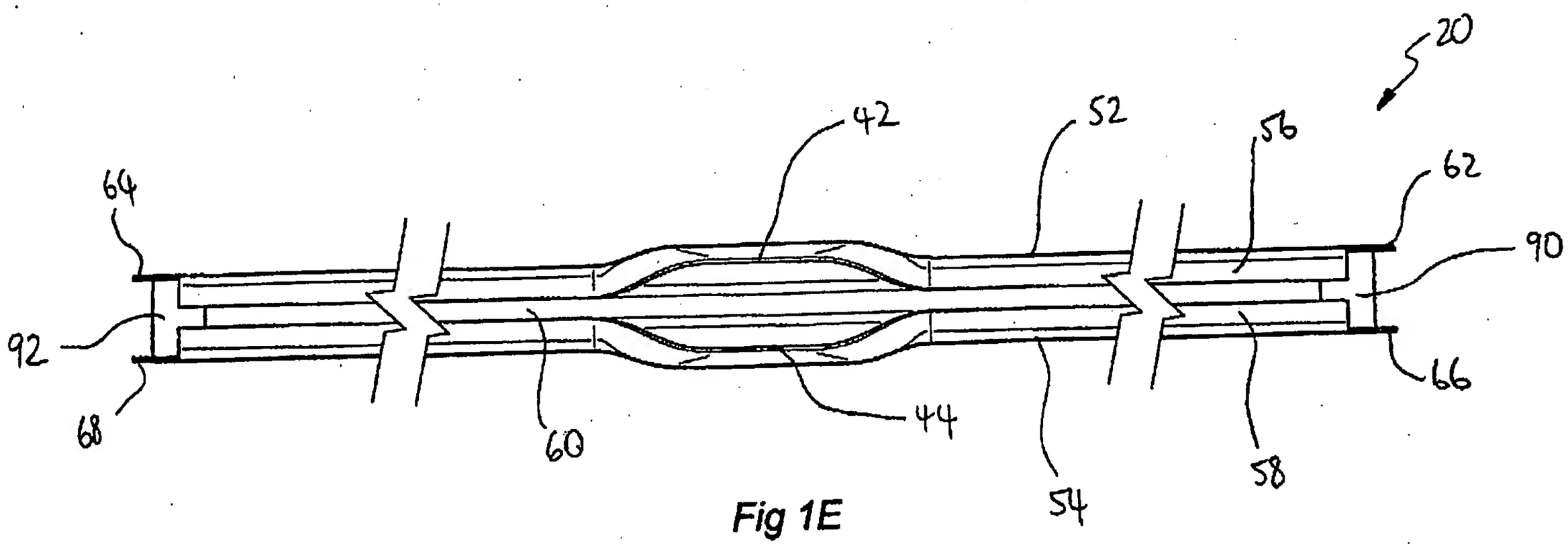


Fig 1E

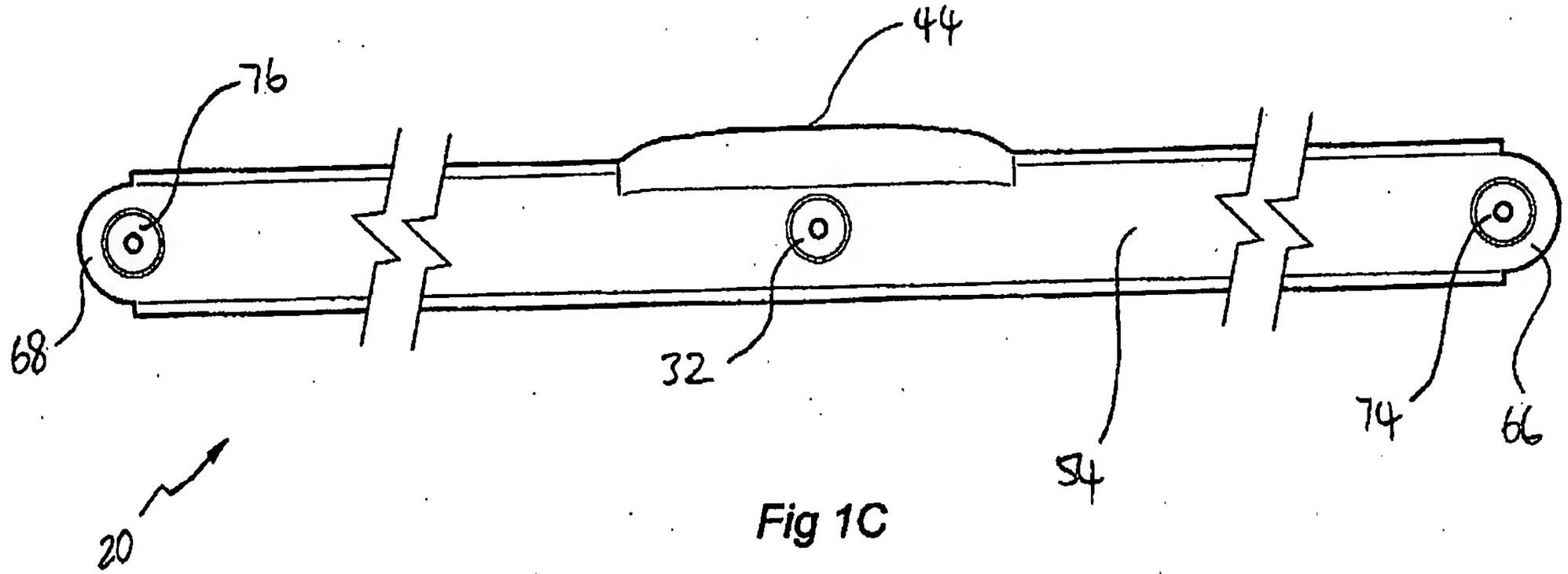
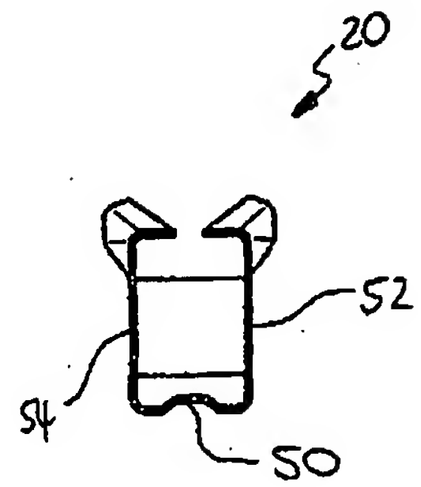


Fig 1C



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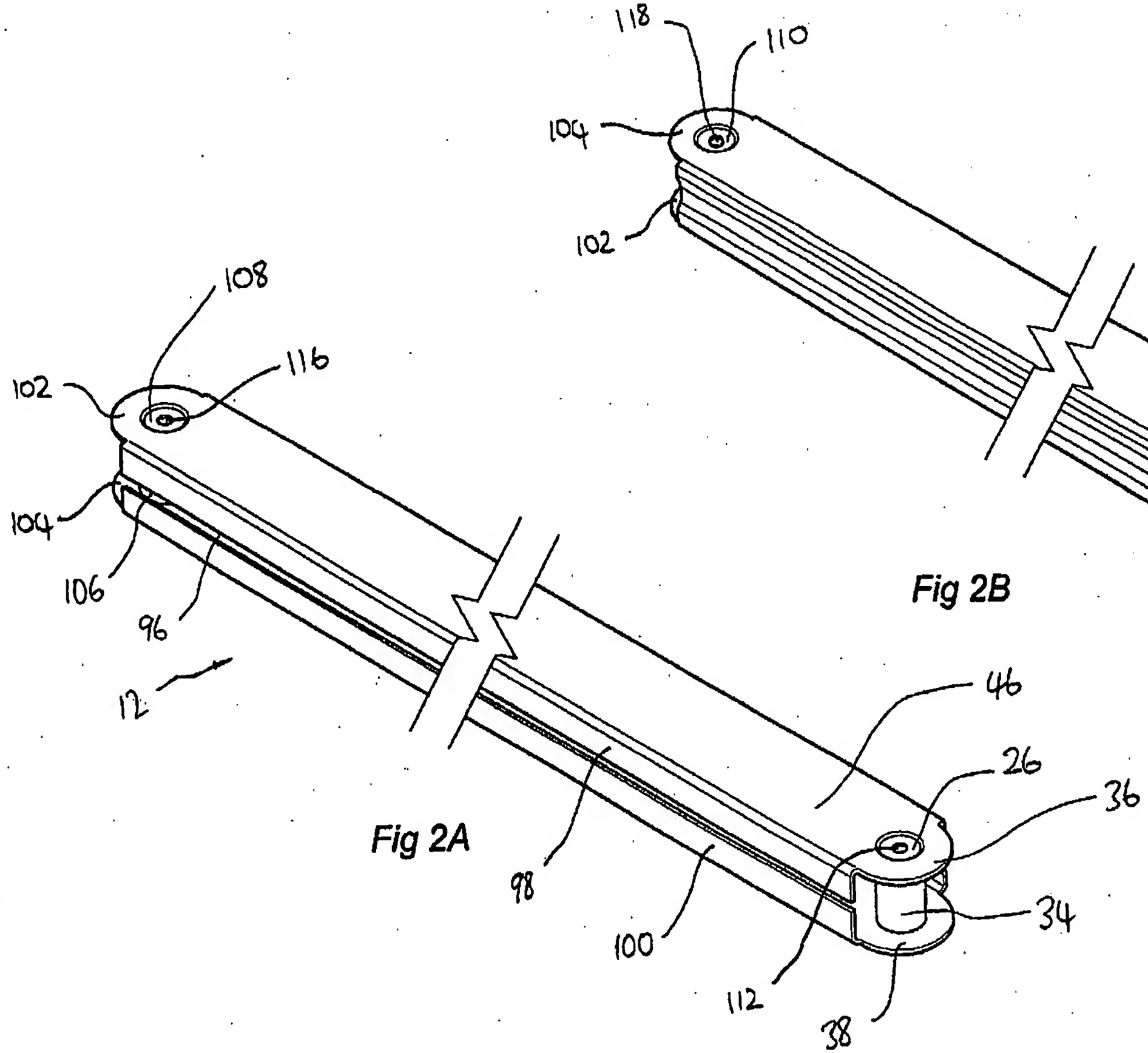

108
116
102
104
106
96
12
46
26
36
34
98
100
112
38

Fig 2A

118
110
104
102
12
48
28
38
36
94
34
114

Fig 2B

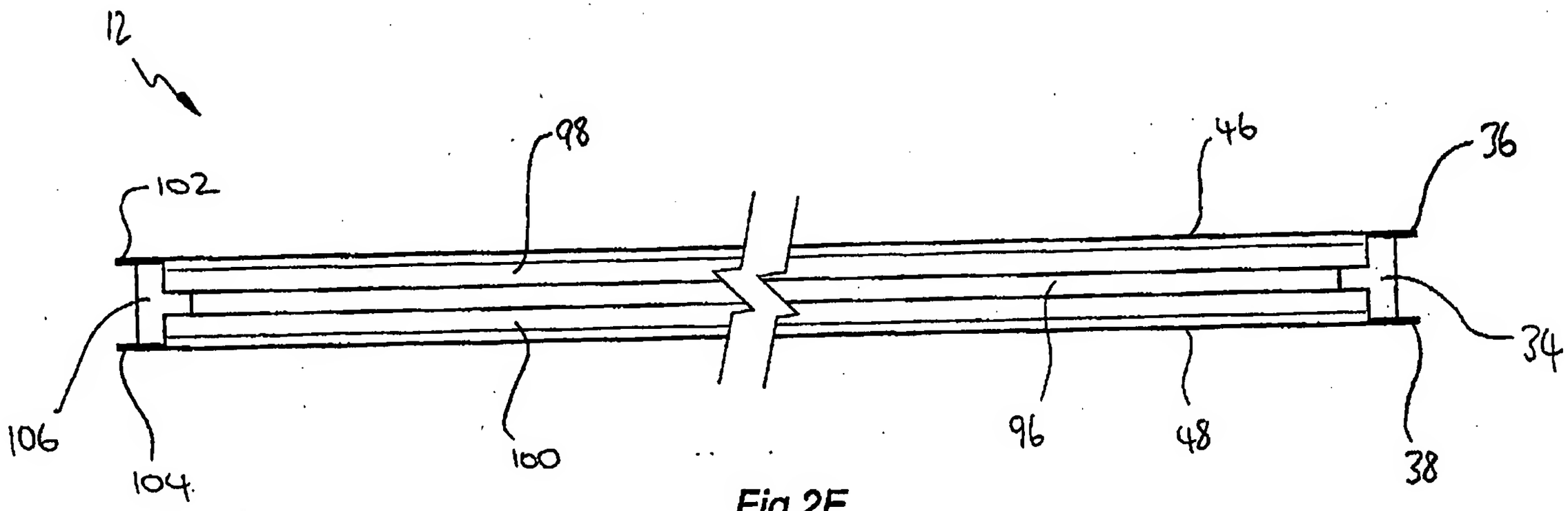
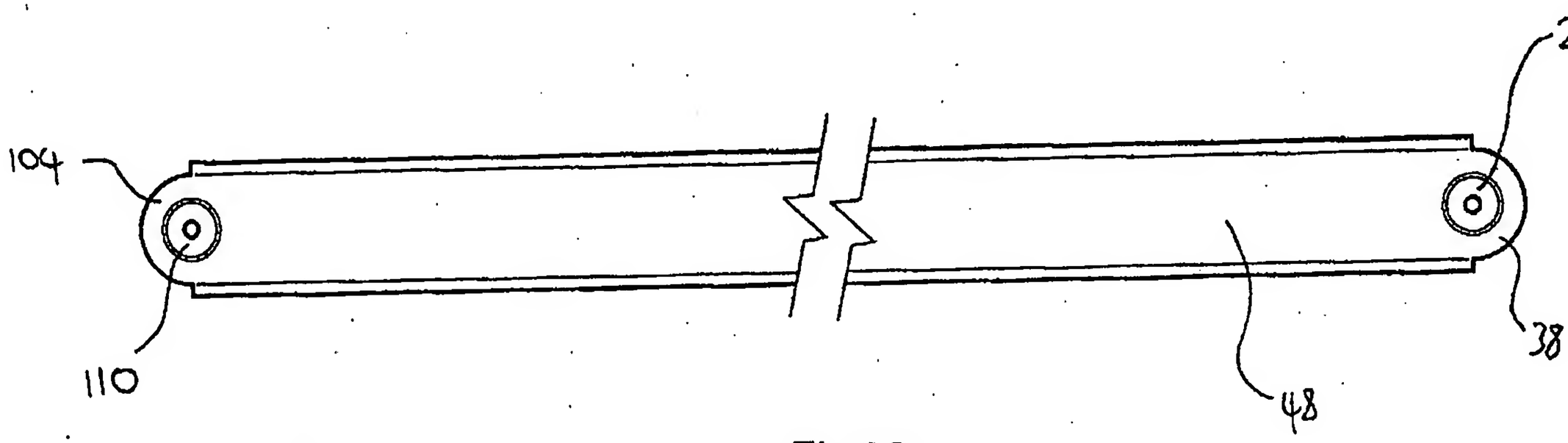


Fig 2E



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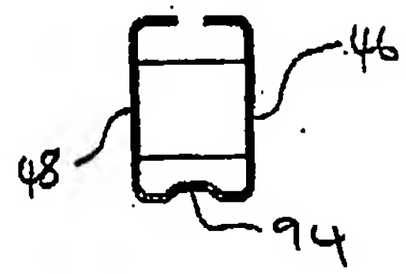

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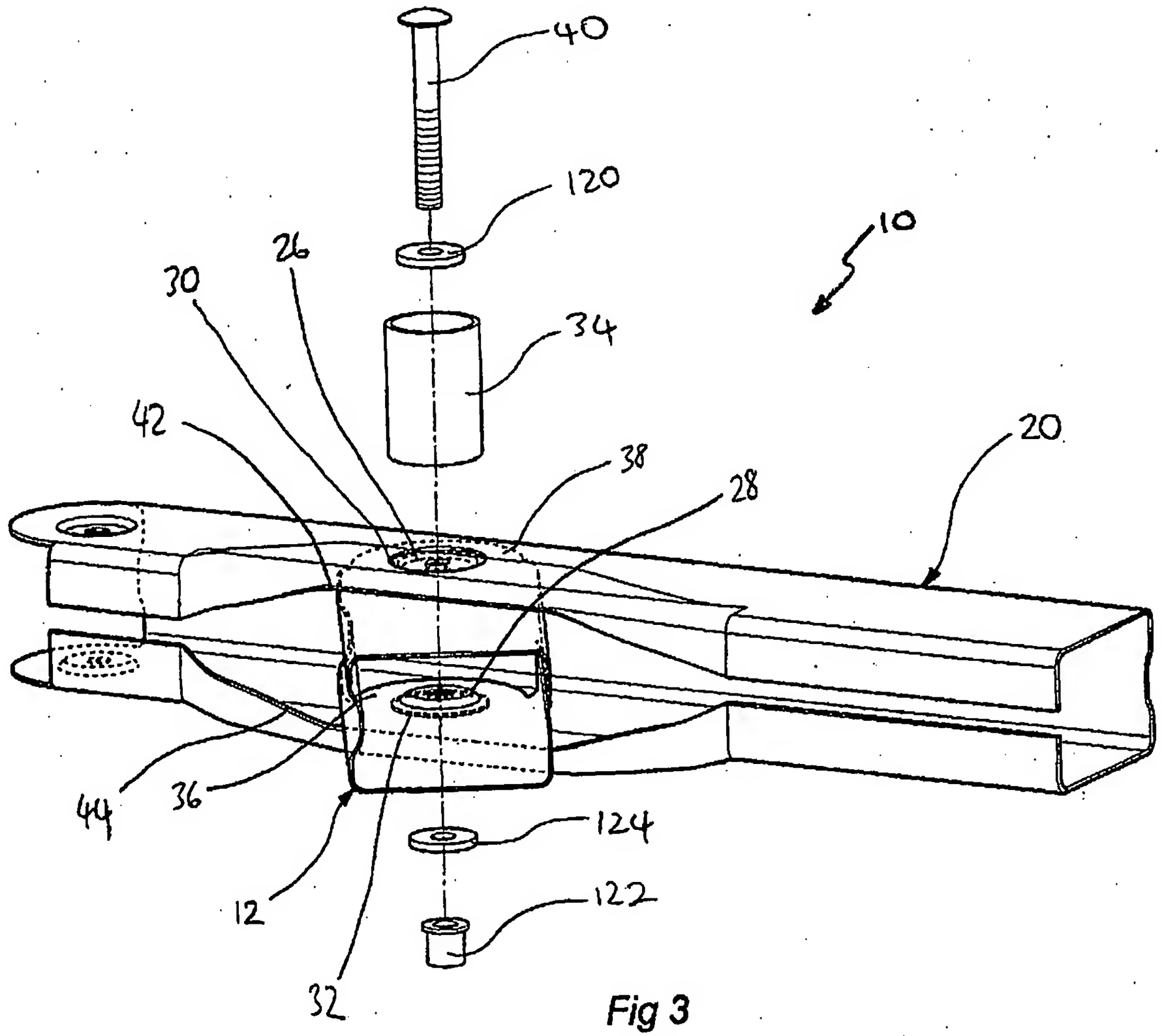

Fig 3

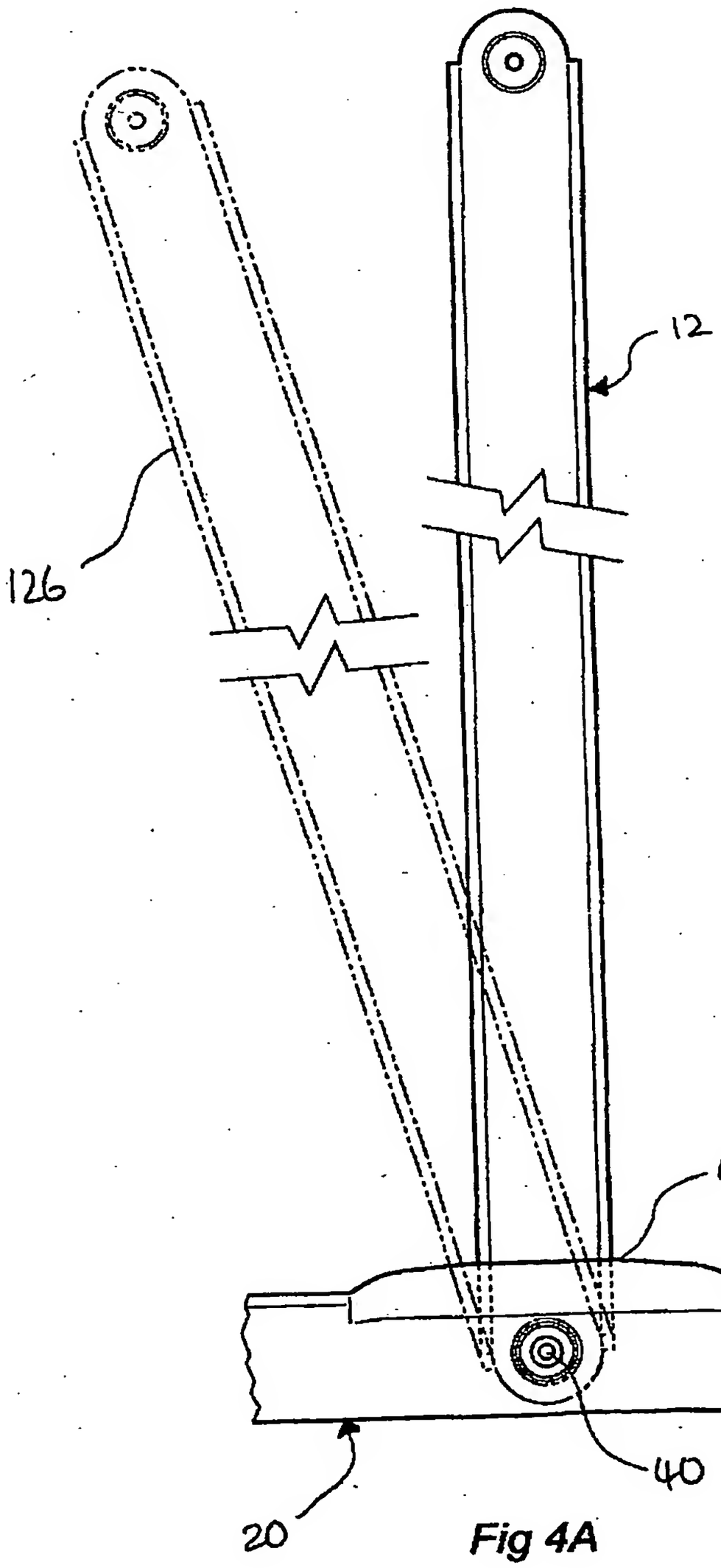

Fig 4A

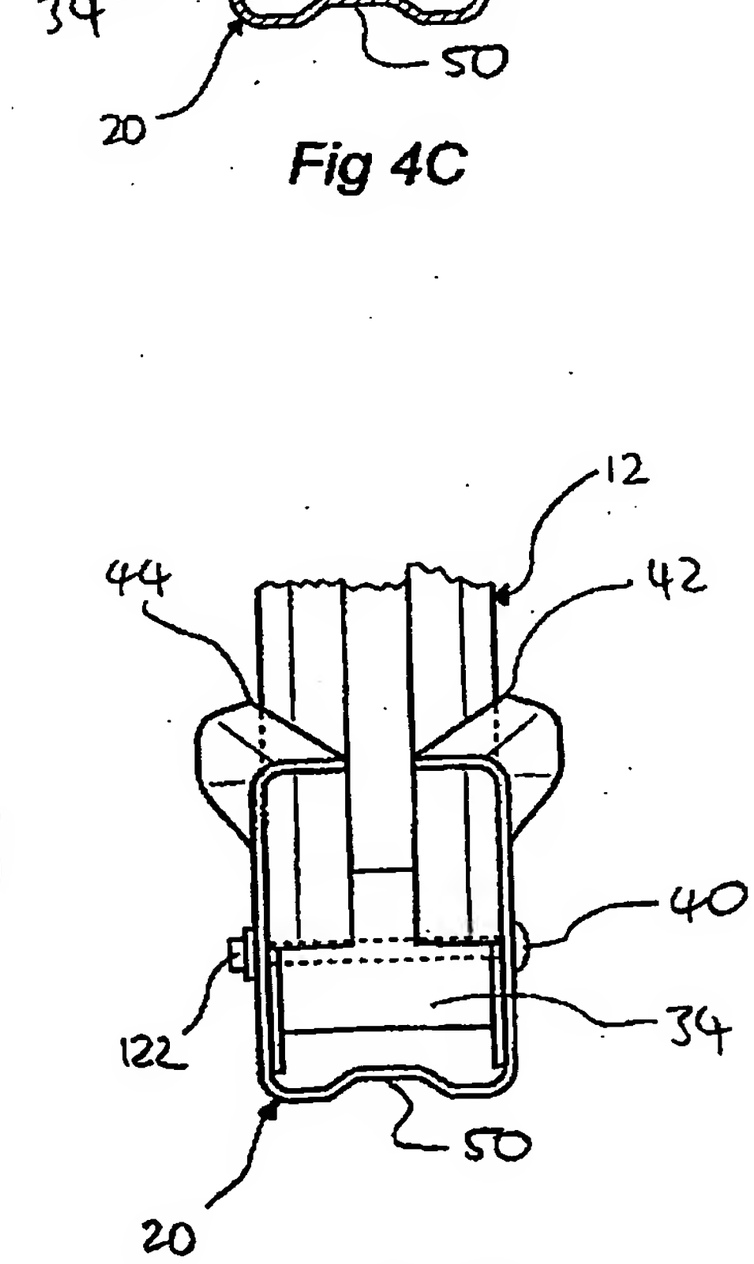

Fig 4C

Fig 4B

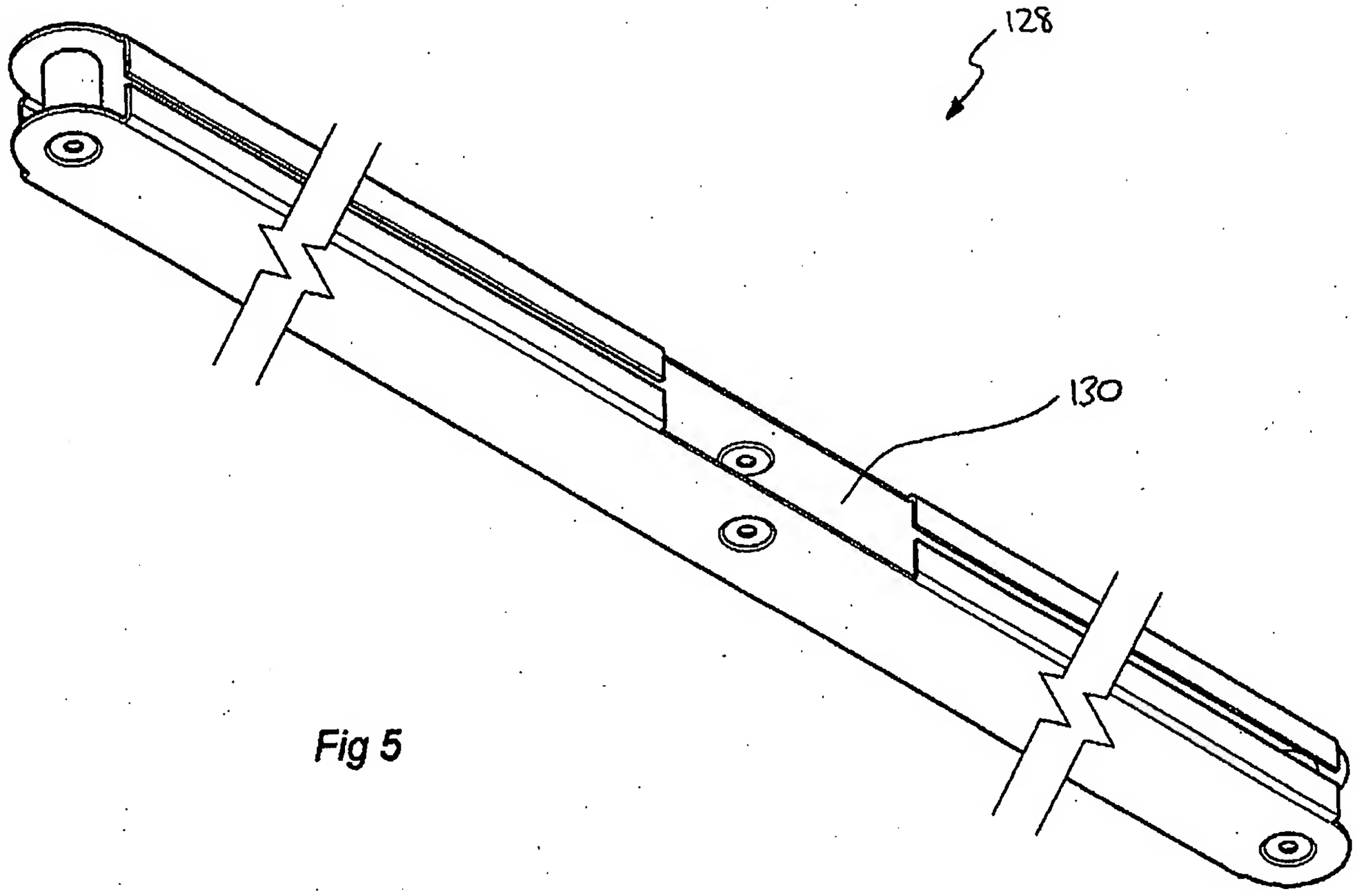

Fig 5

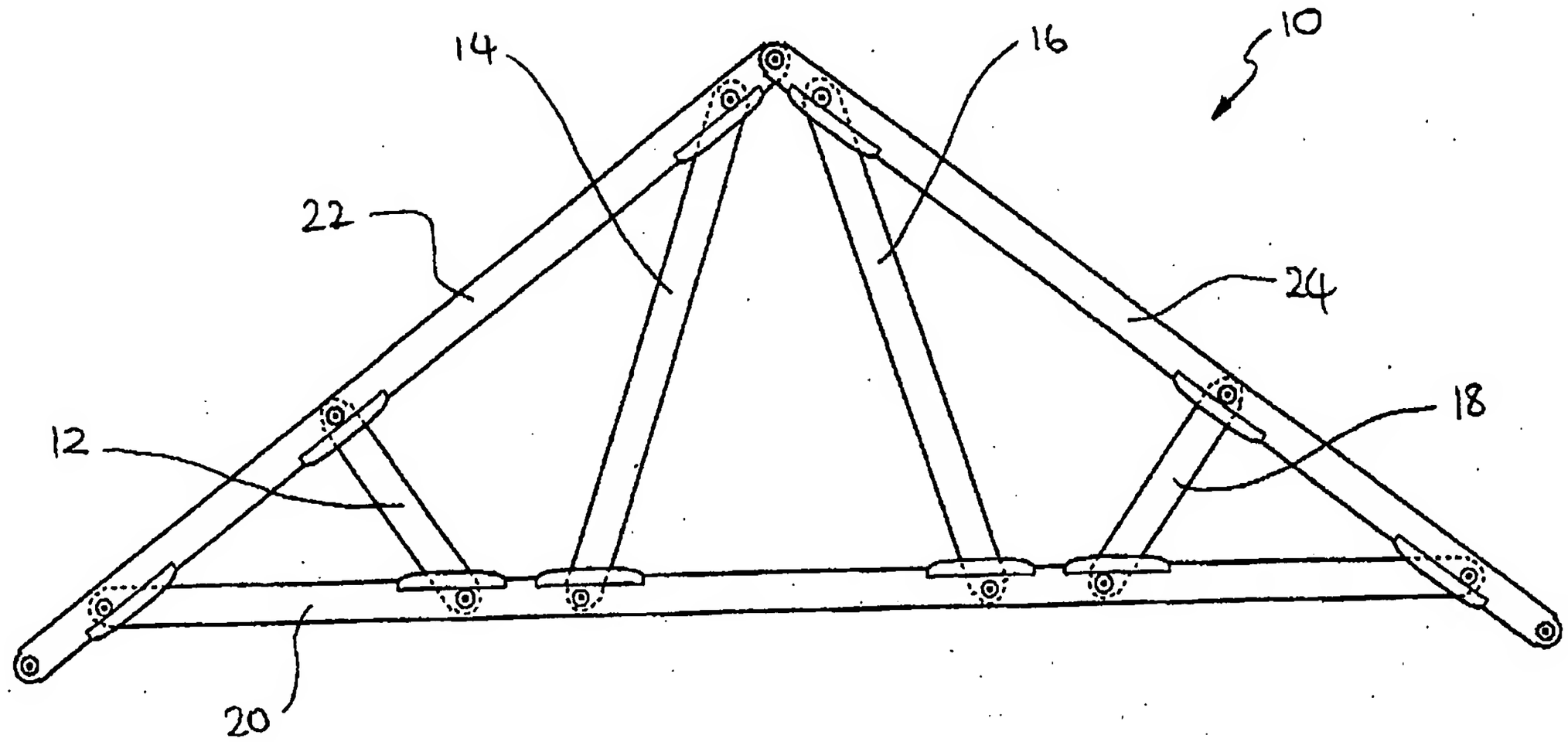

Fig 6

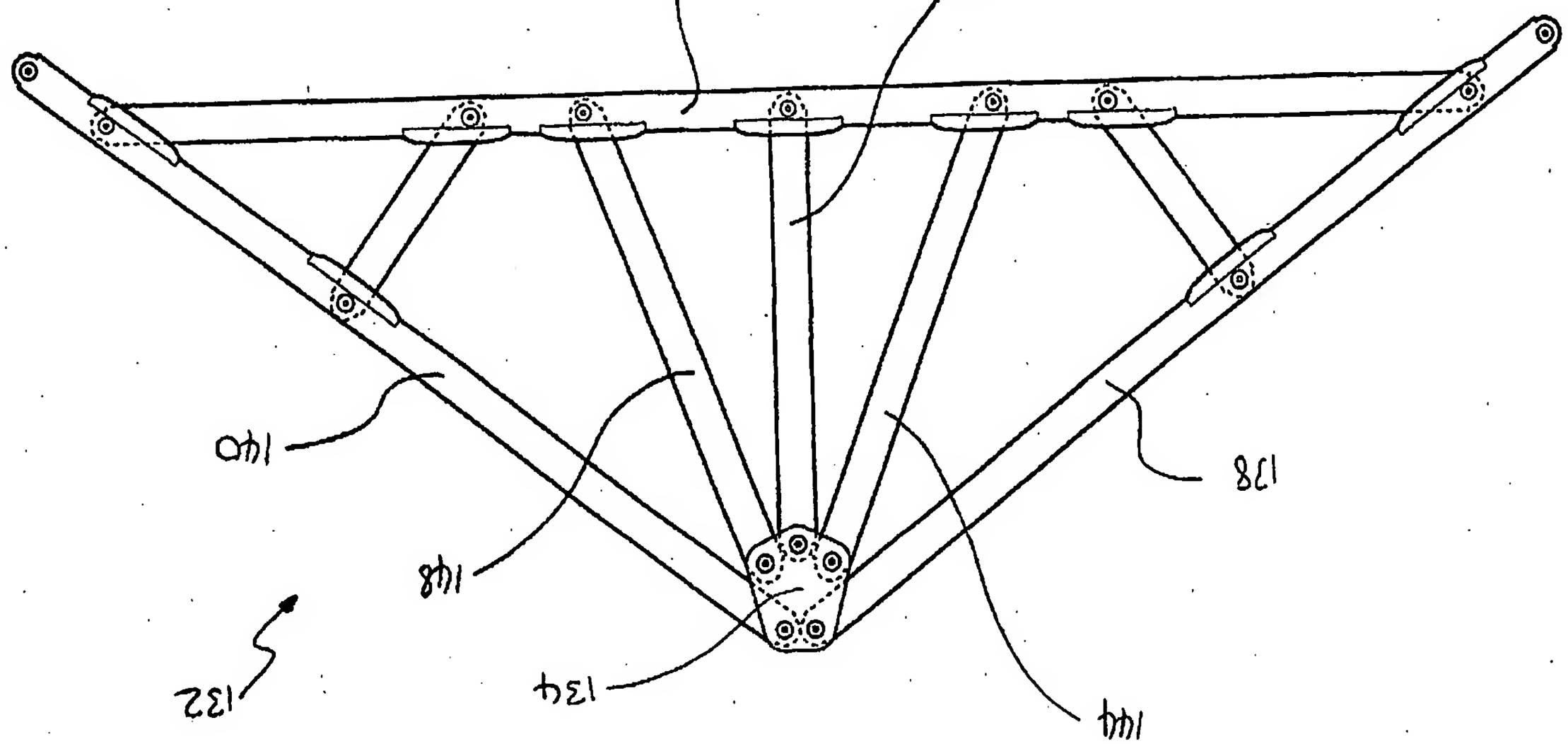

Fig 7